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Response of various doses of organic manure on growth and yield of coriander (*Coriandrum sativum* L)

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Abstract

Response of various doses of organic manure on growth and yield of coriander (*Coriandrum sativum* L) was carried out during winter season of 2018-19 at Acharya Narendra Deva University of Agriculture and Technology Kumarganj, Ayodhya (U.P.) in Randomized Block Design with three replications. Different combinations Control, Poultry manure + *Jeevamrita* + *Beejamrita* + mulching, Poultry manure + mulching, *Jeevamrita* + *Beejamrita* + mulching, NPK 20:30:30 (kg/ha), Poultry manure were used as treatment. Observations were recorded on vegetative parameters such as plant height(cm), number of branches per plant, number of fruiting node per plant, at, 30, 60 and 90 DAS and yield attributes viz. umbel per plant, umbellate per umbel fruit per umbel, fruit per umbellate, seed yield per plant, seed yield per plot on the basis of the analysis of results, it is found that RDF (N: P: K:: 20:30:30) has proved to potential input in case of plant height, branches per plant, fruiting node per plant, umbel per plant, umbellate per plant, umbel per umbellate, fruit per umbel, fruit per umbellate, seed yield per plant, seed yield per plot, coriander displayed highest value amongst the treatment of various combination of organic manure viz., *Beejamrita*, *Jeevamrita* and poultry manure. The treatment number six poultry manure + *Jeevamrita* + *Beejamrita* + mulching came out the best combination for growth and yield characters of coriander for commercial production.

Keywords: organic manure, coriander, growth, yield

Introduction

India is known as 'Home of Spice' The history of Indian spice dates back to beginning of the human civilization. Indian spices and their uses in Vedas (6000 B.C.). Coriander (*Coriandrum sativum* L.) is spice that used widely in Asian, Middle Eastern, North Africa, Mexican and South American cuisines. It is grown and harvested commercially in many parts of the world including Russia, central Europe, and the Mediterranean region, Canada, Mexico. According to Bureau of Indian standard, 63 kinds of spices are grown in the country. Mainly 52 spices are grown in India according to Spices Board, Calicut, and Kerala. Coriander (*coriander sativum* L.) is generally known as "Dhania" having chromosome number $2n=2x=22$ and belong to family Apiaceae (Umbelliferae). In coriander odour and taste is due to essential oil content "Linalool" which varies from 0.1 to 1.0 percent in the dry seeds. These essential oils are used for flavoring liquors, cocoa preparation in confectionary and also to mask the offensive odour in pharmaceutical preparation. The dried ground fruits are major ingredient of curry powder. The whole fruit are also used to flavour fruits like pickle, sauce and confectionary. Coriander is smooth, erect annual herb with a long tap root system, an erect and branching leafy stem (300-700), bipinnate leaves, the pinnae with broad wedge-shaped, toothed segment, the upper leaves becoming gradually more compressed with very narrow linear segment and those of the upper most almost setaceous. The flower is small actinomorphic; the peripheral flowers of an umbel inflorescence are zygomorphic, hermaphrodites or sometime unisexual or polygamous, white or rose-colored terminal umbel, calyx of five teeth, petal obcordate, outer one radiant bifid. Fruits schizocarp, globular, yellowish brown, ribbed composed of two concavo convex pericarps, with or without pedicel. Each pericarp has four, straight, primary ridges and five secondary ridges. Five calyx teeth and a short conical style complete the apex of the seed. Coriander is a great source of potassium, iron, vitamin A, K and C folic acid, magnesium and

calcium. Therefore, it is known all over the world for its medicinal properties. The coriander is famous for its two-primary product. First for flavoring and next for green leaves, which are used in chutney, sauce, curry and other preparation because of its pleasant aroma? The coriander seeds are used as spices in the preparation of curry powder and pickling spices. Dry seed contain 0.1 to 1.0 percent essential oil linalool used in food industries. The plant comes to the flowering stage in about 45-60 day after sowing. The flowers are small, white or pinkish in compound terminal umbels. There are 5 sepals, 5 petals, 5 stamens and two carpel which are free with an epigenous ovary. The fruit is a schizocarp, globular, yellow in color with brown ribs. The size seed is about 3 mm in diameter and ripe seed are aromatic. At dehiscence, the carpel called pericarp separate, each containing a single seed with a copious endosperm and minute embryo.

In India the major growing states are Rajasthan, Gujarat, Madhya Pradesh, Tamil Nadu and Uttar Pradesh. Rajasthan contributes about 43 per cent of coriander production in country. In India, it is grown on an about 5, 83,000- hectare area with 7, 58,000 tones production and 0.76 tons per hectare productivity. In Uttar Pradesh it is grown on an about 3, 97,000 hectares area with 2, 88,000 tons production and 0.48 tons productivity. (Anonymous 2019)

Organic manure like, poultry manure and Jeevamrita are available in plenty in locality and can be effectively utilized for vegetable production. Since poultry manure contain plant nutrient it has a direct effect on plant growth like, any other commercial fertilizer. It is bulky in nature and contain nutrient in small quantities, therefore, large quantity of poultry is needed for application. Besides major nutrient, it also contains trace or micronutrient. Nutrient in readily available from, it also enhances uptakes of nutrient by plant. Jeevamrita influence the physico-chemical and biological proportion of the soil, which, in turn improves its fertility. It is cost effective and renewable. Source of plant nutrient to supplements the chemical fertilizer. Poultry manure litter applied to agriculture lands serve as a source of macro nutrient such as N and P for major crops (Nyakatawa and Reddy 2002) [9]. Poultry litter also contains high concentration of some trace element such as Cu, Zn and as (Van der Watt *et al.* 1994; Moore *et al.* 1998). The high nitrogen and balanced nutrient are the reason that chicken manure compost is best kind of manure to use. The present investigation entitled "Response of various doses of organic manure on growth and yield of coriander (*Coriandrum sativum* L.)"

Material and Method

The present investigation entitled "Response of various doses of organic manure on growth and seed yield of coriander (*Coriandrum sativum* L.) was carried out during Rabi season of 2019-20 at Main Experiment Station (Instructional farm), Narendra Nagar (Kumarganj) Ayodhya U.P. India. The details of experimental site. The experiment was laid out in randomized block design (RBD). All treatments were randomly allocated among the plots and replicated three times. Total 6 treatments [T₁ – Control, T₂ – Poultry manure (5-7 t/ha) + Jeevamrita (7%) + Beejamrita (10%) + mulching, T₃ – Poultry manure, T₄ – Jeevamrita + Beejamrita + mulching, T₅- NPK 20:30:30 (kg/ha), T₆- Poultry manure.

Preparation of Beejamrita (only for seed treatment)

Beejamrita is a rich bio-formulation containing consortia of microbes. It is a solution of fermented cow's dung, cow's urine, virgin soil and pulse flour. Ingredients for preparation of Beejamrita to be applied in one acre of area are given below

Ingredient for Beejamrita: (only for seed treatment)

• Cow dung	:	5 kg
• Cow urine	:	5 litres
• Gur	:	500 gm.
• Pulse flour	:	50 gm.
• Water	:	20 litres

Preparation of Jeevamrita

Jeevamrita is a rich bio-formulation containing consortia of microbes. It is a solution of fermented cow's dung, cow's urine, sugarcane juice, virgin soil and pulse flour. Ingredients for preparation of Jeevamrita to be applied in one acre of area are given below:

Ingredients for Jeevamrita

• Cow dung	:	10 kg
• Cow urine	:	10 litres
• Gur	:	2kg
• Virgin soil	:	250 gm
• Pulse flour	:	2 kg
• Water	:	200 litres

The required quantities of fresh cow dung and cow urine were mixed thoroughly in 200 litres of water in a mud pot. Then 4 litres of sugarcane juice, 2 kg pulse flour and 1 kg of virgin soil were added in it. The soil under a tree or undisturbed location (chemicals free soil) is considered as a virgin soil. This solution was stirred well and kept for 3 days for fermentation under shade. The pot of Jeevamrita solution was covered with a muslin cloth to avoid any undesirable contamination. After 3 days of fermentation, solution of Jeevamrita was prepared and was used according to treatments. Poultry manure is the faces of chickens used as an organic fertilizer, especially for soil low in nitrogen. Of all animal manure, it has the highest amount of nitrogen, phosphorus, and potassium, fresh chicken manure contains 0.9% to 1.5% nitrogen, 0.4 to 0.5% phosphorus and 0.8% potassium one chicken produce approximately 8-11 pounds manure monthly chicken manure can be used to create homemade plant fertilizer. Mulch is a layer of material applied to the surface or soil reason for applying mulch includes conservation of soil moisture, improving fertility and health of the soil, including weed growth and enhancing the visual appeal of the area. Mulch is usually, but not exclusively, organic in nature. It may be permanent (e.g. plastic sheeting) or temporary (bark chips). It may be applied to bare soil or around existing plant. Mulch manure or compost will be incorporated naturally into the soil by the activity of worm and another organism. The process in used both in commercial crop production and in gardening, and when applied correctly, can dramatically improve soil productivity.

Microbial load in different bio-enhancers

Microorganisms	Population (cfu ml ⁻¹)	
	<i>Panchgavya</i>	<i>Jeevamrita</i>
Bacteria	26.1 x 10 ⁵	15.4 x 10 ⁵
Fungi	18.0 x 10 ³	10.5 x 10 ³
<i>Actinomycetes</i>	4.2 x 10 ³	6.8 x 10 ³
P solubilizes	5.7 x 10 ²	2.7 x 10 ²
Free living N ₂ fixers	2.7 x 10 ²	3.1 x 10 ²

Results and Discussion

Application of different organic manure improved the vegetative growth significantly. Maximum plant height was recorded with treatment T₂ (11.34cm, 13.37cm and 11.34cm, 69.85cm) followed by T₅ (69.85cm, 71.30cm) at 30 and 45 DAT. Maximum number of branches per plant also recorded with treatment T₅ (11.34cm, 16.60) followed by T₅ (13.07, 16.40) at 30, 60 and 90 DAS (Table1). These results may be attributed to conjoin effects of spray of *Jeevamrita* and application of *poultry manure* and *Beejamrita*. The result might be due to the high water-holding capacity of poultry manure and proper supply of macro- and micro-nutrients. Similarly, reported that poultry manure has a positive effect on biomass production which subsequently enhanced the plant height. The present findings are in conformity Darzi *et al.* (2012)^[5] in anise and Asgharipour (2012)^[4] in cumin. Observations were recorded on vegetative parameters *viz.*, plant height (cm) Days taken to 50% flowering, Number of Branches per plant, Number of Fruiting node per plant, Number of Umbel per plant, Number of Umbellate per umbel, Number of fruit per umbel, Number of Fruit per umbellate, Seed yield per plant, Seed yield per plot.

The height of coriander plant at 30 DAS was significant influenced by the use of various treatment combination Further, it was noticed that poultry manure @ 5-7 t ha + 100% RDF recorded the maximum plant height of 14.55 cm, followed by poultry manure @ 5-7 t ha + 100% RDF (12.61 cm) However, the minimum plant height was found in poultry manure @ 5-7 t ha + *Jeevamrita* solution. It was noticed that poultry manure @ 5 t ha + 100% RDF recorded the significant maximum plant height (72.234 cm) followed by *Jeevamrita* as per require +100 RDF (71.22 cm) While. The minimum plant height was recorded in poultry manure @ 5 t ha + 50 % RDF. It was observed that the *Jeevamrita* + 100% RDF recorded the maximum height of (91.92 cm) followed by poultry manure @ 5-7 t ha + 100% RDF with a height of (89.87 cm) as compared to other treatment. However, the minimum plant height (87.30 cm) was recorded with NPK+50% RDF. Increase in number of branches per plant was significant with regard to interaction effect. It was observed that *Jeevamrita* as per require + 100% RDF recorded the maximum value of 9.67 followed by poultry manure @ 5 t ha + 100% RDF (9.13) was recorded with NPK + 50 RDF. In case of interactions, number of umbels per plant were significantly influenced by poultry manure @ 5 t ha⁻¹ + 100 % RDF (3.53) followed by *Jeevamrita* + 100 % RDF (34.13). The least number of umbels per plant (4.43) were recorded in NPK @ 10 t ha⁻¹ + 50 % RDF. Day to 50% flowering was significantly influence by treatment

combination. Poultry manure @ 5-7 t + 50% RDF showed significant early 50% flowering (64 day) followed by *Jeevamrita* as per require + 50% RDF (57.67 day). Late 50% flowering was observed in poultry manure @ 5 t ha + 100% RDF (64 day). Interaction effects on number of umbellate Per umbel were non-significant However, the maximum number of umbellate per umbel (7.71) were found with poultry manure @ 5 t ha⁻¹ + 100 % RDF followed by *Jeevamrita* ha⁻¹ + 100 % RDF (7.11), whereas, the least number of umbellate per umbel (5.97) was noted in FYM @ 10 t ha⁻¹ + 50 % RDF. The maximum number of umbels per plant (33.43) was found with 100 % RDF and the minimum (30.31) in 50 % RDF. In case of interactions, number of umbels per plant were significantly influenced by poultry manure @ 5 t ha⁻¹ + 100 % RDF (36.27) followed by *Jeevamrita* + 100 % RDF (34.13). The least number of umbels per plant (29.03) were recorded in NPK @ 10 t ha⁻¹ + 50 % RDF. Interaction effect on number of fruits per umbel was found to be significant and the maximum number of fruits per umbel (36.74) were recorded in poultry manure @ 5 t ha⁻¹ + 100 % RDF followed by *Jeevamrita* + 100 % RDF (34.13). The least number of fruits per umbel (27.73) was noted in *Jeevamrita* + 50% RDF. However, the maximum number of umbellate per plant (7.71) were found with poultry manure @ 5 t ha⁻¹ + 100 % RDF followed by vermicompost @ 5 t ha⁻¹ + 100 % RDF (7.11), whereas, the least number of umbellate per umbel (5.97) was noted in FYM @ 10 t ha⁻¹ + 50 % RDF. In case of interactions, seed yield per plant was found to be significant and the maximum (7.14 g) in poultry manure @ 5 t ha⁻¹ + 100 % RDF followed by *Jeevamrita* + 100 % RDF (6.72 g). The least seed yield per plant (3.62 g) was recorded in FYM @ 10 t ha⁻¹ + 50% RDF. In case of interaction, the maximum seed yield per plot (2.04 kg) was found in poultry manure @ 5 t ha⁻¹ + 100 % RDF followed by *Jeevamrita* + 100 % RDF (1.98 kg). The least seed yield per plot (1.27 kg) was recorded in FYM @ 10 t ha⁻¹ + 50% RDF.

The nutrient supplementation through organic manures and fertilizers significantly increased various growth parameters *viz.*, plant height at various crop growth stages, and number of branches per plant of coriander. Increase in plant height at 30, 60 and 90 DAS with regard to fertilizer levels was observed significant and the maximum height was found in 100 % RDF and the minimum with 50 % RDF. 100 % RDF was found to be significant over 50 % RDF. The present finding is in agreement with the findings of Kumar *et al.* (2007); Nagar *et al.* (2009) and Khalid (2012)^[7, 8, 6].

With regard to fertilizer levels, variation in days to first flowering and 50% flowering was observed to be significant. Early first flowering and 50 % flowering was observed in 50 % RDF and delayed flowering in 100 % RD. Further it was observed that variation in days to first flowering and 50% flowering was significantly influenced by various treatment combinations. Application of FYM @ 10 t ha⁻¹ + 50% RDF recorded early first flowering and 50 % flowering followed by FYM @ 20 t ha⁻¹ + 50% RDF. However, late flowering was observed with poultry manure @ 5 t ha⁻¹ + 100 % RDF. The findings are in agreement with findings of Subramanian and Vijayakumar (2001)^[10] in fenugreek.

Appendix – II: Mean performance of coriander for various characters due to different treatments.

Treatments	Plant height (30 DAS)	Plant height (60 DAS)	Plant height (90 DAS)	Number of branches per plant	Number of fruiting node per plant	Days to 50% flowering	Number of Umbellates/ umbel	Number of umbels/ plant	Number of Fruit per umbel	Number of Fruit per umbellate	seed yield per plant (g)	seed yield/ plot (kg)
Control	11.34	65.20	65.20	7.9	19.42	58.1	5.9	29.89	28.2	6.5	4.9	1.12
Poultry + Jeevamrita + Beejamrita + mulching	13.37	69.85	69.85	8.63	20.17	62.83	6.82	32.33	32.52	6.82	5.53	1.82
Poultry manure + mulching	12.61	69.24	69.24	8.47	19.48	60.72	6.51	31.87	30.85	6.65	5.2	1.61
Jeevamrita + Beejamrita + mulching	12.97	69.38	69.38	8.52	19.55	61.5	6.65	32.03	31.31	6.51	5.13	1.67
NPK	14.55	71.30	71.30	9.07	21.86	64	7.06	33.67	33.69	7.06	6.09	1.85
Poultry manure	12.20	69.17	69.17	8.25	19.42	59.83	6.5	30.92	29.85	6.7	4.56	1.7
SE m+ ₋	0.186	0.810	0.776	0.181	0.335	0.071	0.088	1.139	0.088	0.080	0.355	0.530
CD at 5%	0.592	2.585	2.47	0.386	1.071	0.226	0.281	3.363	0.281	0.255	1.134	1.134

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